EXECUTIVE SUMMARY

ES.1 Introduction

On November 8, 2012, the Los Angeles Regional Water Quality Control Board (LARWQCB) adopted a new National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Permit, Order R4-2012-0175 (2012 Permit) (LARWQCB, 2012), for the coastal watersheds of Los Angeles County (County). This monitoring report is submitted pursuant to the Monitoring and Reporting Program for the 2012 Permit, attached as Exhibit E to that permit. In accordance with the 2012 permit, permittees were required to develop a new monitoring program. In doing so, each permittee developed an Integrated Monitoring Program (IMP) or Coordinated Integrated Monitoring Program (CIMP) through which it will meet its monitoring obligations. The County of Los Angeles and the Los Angeles County Flood Control District (LACFCD) chose to participate in the development of CIMPs for their respective watersheds. The CIMPs were submitted to the LARWQCB on or before June 30, 2014. Most of these CIMPs have been approved or approved with conditions. The County and the LACFCD are currently awaiting approval of the remaining CIMPs.

Section IV.C.8 of the Monitoring Program provides that the monitoring requirements pursuant to Order No. 0-182 (2001 Permit) (LARWQCB, 2001a), Monitoring and Reporting Program CI 6948, and approved Total Maximum Daily Load (TMDL) monitoring programs shall remain in effect until the Executive Officer approves the CIMPs. Accordingly, monitoring during the 2014-2015 monitoring year was conducted under the protocols set forth in that order and those plans. This report presents the associated results.

ES.1.1 Core Monitoring Program

Pursuant to the protocol set forth in the 2001 Monitoring Program, monitoring was conducted at seven mass emission stations (MES) (i.e., Ballona Creek (S01), Malibu Creek (S02), Los Angeles River (S10), Coyote Creek (S13), San Gabriel River (S14), Dominguez Channel (S28), and Santa Clara River (S29)). The 2001 Monitoring Program also provided that tributaries shall be monitored to identify sub-watersheds where stormwater discharges and non-stormwater (dry weather) discharges are causing or contributing to exceedances of water quality standards, and to prioritize drainage and sub-drainage areas requiring management actions. During the 2014-2015 monitoring year, sampling was continued at six tributary monitoring stations in the Malibu Creek Watershed, including Upper Las Virgenes Creek (TS25), Cheseboro Canyon (TS26), Lower Lindero Creek (TS27), Medea Creek (TS28), Liberty Canyon Channel (TS29), and PD 728 at Foxfield Drive (TS30).

Mass emission samples were also analyzed for toxicity during two dry weather events and during two storm events, with the exception of the San Gabriel River MES, where only one dry weather sample was collected due to dry conditions.

Trash monitoring was also conducted at MES to identify areas impaired for trash. Visual observations of trash were made, and at least one photograph was taken at each MES after the first storm event and at least three additional storm events, with the exception of the Santa Clara

MES (two additional storm events). Trash monitoring was also conducted in the Ballona Creek and Los Angeles River watersheds (described in Appendices I and J, respectively).

In addition, the City of Los Angeles monitored shoreline stations to evaluate the impacts of urban runoff on coastal receiving waters and beneficial uses and performed an annual assessment of shoreline water quality data. The City of Los Angeles's assessment is included as Appendix D of this monitoring report.

ES.1.2 Regional Monitoring

The LACFCD participated in Bight'13 regional monitoring programs, including the study of microbiological quality of coastal streams and the development of water quality guidelines and assessment of water quality conditions of Areas of Special Biological Significance (ASBS). Results are posted on the Southern California Coastal Water Research Project (SCCWRP) website as they become available.

Bioassessment was also conducted to help assess the biological integrity of a waterbody and to help determine potential sources of biological impairment, where they may exist. A total of 16 sampling stations representing the six major watersheds were selected to represent the diverse environments of the Los Angeles region. The final report for the most recent year of the Bioassessment Monitoring Program (2014) is included in Appendix H.

ES.2 Summary of Methodology

The core monitoring program was conducted in compliance with the monitoring protocols set forth by the 2001 Permit and the Stormwater Quality Management Program (SQMP). Water quality samples were collected from seven watersheds and analyzed as part of the 2014–2015 Monitoring Program. The seven watersheds included Ballona Creek, Malibu Creek, Los Angeles River, Coyote Creek, San Gabriel River, Dominguez Channel, and Santa Clara River. Collection and analysis of stormwater runoff during wet weather conditions and ambient (dry) weather runoff were performed at MES and tributary locations.

Sample collection was required at MES locations for a minimum of three storm events, including the first storm event of the season, and two dry events. Due to dry conditions during the 2014-2015 monitoring season, only one dry weather sample was collected at the San Gabriel River MES (S14).

At the tributary stations located in the Malibu Creek Watershed, sample collection was required for a minimum of four storm events, including the first storm event of the season, and one dry event. Stormwater samples and ambient water samples were analyzed in accordance with the 2001 Permit requirements for chemical constituents, indicator bacteria, and toxicity to bioassay test organisms.

ES.2.1 Precipitation and Flow Monitoring

Precipitation monitoring was conducted at or near each MES using the various automatic rain gauges that LACFCD operates throughout Los Angeles County. Existing gauges near the monitored watersheds were also used in stormwater runoff calculations and were essential in developing runoff characteristics for these watersheds.

Because the monitoring program required flow-weighted composites for many constituents, flow monitoring equipment was used to trigger the automated samplers. Flows were determined from water elevation measurements.

ES.2.2 MES and Tributary Wet and Dry Weather Sampling

During the 2014-2015 monitoring season, analyses of stormwater samples consisted of field measurements, grab samples, and composite samples. Field measurements included temperature, dissolved oxygen and hydrogen ion concentration (pH) at Malibu Creek MES (S02) and Santa Clara MES (S29) during wet weather. Grab samples were collected during the initial portion of the storm event (i.e., on the rising limb of the hydrograph) and were analyzed for indicator bacteria and conventional pollutants. Composite samples consisted of a mixed sample created by combining a series of aliquots of specific volume collected at specific flow-volume intervals. Flow-weighted composite storm samples were obtained using an automated sampler at all stations except the Santa Clara MES, where composite samples were obtained by sampling discretely from the river at 20-minute intervals for the first three hours of the storm (or the duration of the storm if it was less than three hours). The discrete samples were then mixed in the laboratory in proportion to the estimated flow rates. Composite samples were analyzed for conventional constituents, general minerals, nutrients, metals, semivolatile organics, base neutral, chlorinated pesticides, polychlorinated biphenyls (PCBs), organophosphate pesticides, and herbicides. Water column toxicity analyses were also performed during two wet weather events and two dry weather events for composite samples collected at the MES except at the San Gabriel River MES, which was only monitored during one dry weather event. In addition, storm events resulting in at least 0.25 inch of rainfall were monitored for total suspended solids (TSS) at all MES equipped with automatic samplers.

Dry weather sampling methods were similar, except samples were collected as time-weighted composites over a 24-hour period.

Quality assurance (QA)/quality control (QC) is an essential component of the monitoring program. All QA/QC procedures were followed for training of field personnel; labeling of bottles; chain of custody; sampling equipment setup; and sample collection, transport, and analysis.

ES.3 Summary of Monitoring Results

The 2001 Monitoring Program consists of core monitoring, regional monitoring, and special studies. The core monitoring program included the following elements:

- Mass emission monitoring.
- Water column toxicity monitoring.
- Tributary monitoring.
- Shoreline monitoring.
- Trash monitoring.

ES.3.1 Mass Emission Monitoring

Based on results of the mass emission monitoring, the following three water quality analyses were conducted:

- A comparison to applicable water quality standards.
- An analysis of pollutant loads and trends.
- An evaluation of the correlation between constituents of concern and TSS.

Monitoring results were compared to water quality indicators based on water quality objectives (WQOs) established in the Water Quality Control Plan for the Los Angeles Region (Basin Plan) (LARWQCB, 1994) and the California Toxics Rule (CTR), 40 Code of Federal Regulations (CFR) Part 131. The Basin Plan is designed to enhance water quality and to protect the beneficial uses of all regional waters. The CTR promulgates criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries.

A summary of the constituents that did not meet applicable WQOs at MES for at least one event is presented in the table below.

Summary of Constituents that Did Not Meet Water Quality Objectives at Mass Emission Stations during 2014-2015 for One or More Events

Mass Emission Station/Watershed	Wet	Dry
Ballona Creek (S01)[1,2,3]	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved lead, Nitrite as N, Dissolved oxygen, pH	NA
Malibu Creek (S02)	*E. coli*, Sulfate	Sulfate
Los Angeles River (S10)[1,2,3]	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved lead, Nitrite as N, Dissolved oxygen	*E. coli*, pH
Coyote Creek (S13)[2,3]	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved oxygen	*E. coli*, pH
San Gabriel River (S14)[2,]	Dissolved copper, Cyanide, Dissolved oxygen	NA
Dominguez Channel (S28)[1,2,3]	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved lead, Dissolved oxygen	*E. coli*, pH
Santa Clara River (S29)	*E. coli* Dissolved copper Dissolved zinc	NA

NA – all applicable water quality objectives were met.
[1]More urbanized watersheds.
[2]Subject to the bacteria water quality objective high-flow suspension (LARWQCB, 2003).
[3]The high flow suspension did not apply to Ballona Creek, Los Angeles River, Coyote Creek, and Dominguez Channel during 2014-15Event04.

ES.3.2 Water Column Toxicity Analysis

Water column toxicity monitoring was performed at all MES. In total, four samples were analyzed for toxicity at each station (i.e., two wet weather samples and two dry weather samples). The only exception was San Gabriel River (S14), where only one dry weather sample was collected due to the absence of flow during the first dry weather monitoring event.

One freshwater species (water flea) and one marine species (sea urchin) were used for toxicity testing. The water flea, *Ceriodaphnia dubia*, was used in chronic seven-day reproduction and survival bioassays. The sea urchin, *Strongylocentrotus purpuratus*, was used in chronic fertilization bioassays.

During wet weather, bioassay tests exposing *C. dubia* to wet weather effluent samples from each of the seven MES indicated that no toxicity to *C. dubia* survival or reproduction was observed for both events. Toxicity tests measuring *S. purpuratus* fertilization in exposures to wet weather effluent samples from all seven MES indicated that no toxicity to *S. purpuratus* fertilization was observed in the test samples.

During dry weather, bioassay tests exposing *C. dubia* to dry weather effluent samples from each MES indicated that no toxicity to *C. dubia* survival or reproduction was observed for both events. Toxicity tests measuring *S. purpuratus* fertilization in exposures to dry weather effluent samples from each MES indicated that no toxicity to *S. purpuratus* fertilization was observed in the test samples.

ES.3.3 Wet Weather and Dry Weather Constituent Loads for Each Mass Emission Station

Constituent loads were calculated to determine whether there was a relationship between storm event size and the total load for a given constituent. During wet weather, calculated loads varied between stations and storm events. First-flush loading signatures (i.e., higher loads during the first monitored storm of the season than would be expected based on rainfall totals) were observed for at least one constituent at the following three MES locations: Ballona Creek, Malibu Creek, and Dominguez Channel. No first-flush loading signature was observed at the Los Angeles River, Coyote Creek, San Gabriel River or Santa Clara River MES. Generally, rainfall totals were similar during 2014-15Event09 and 2014-15Event10 (1.06 to 3.00 inches) and were higher than the totals that were observed during 2014-15Event04 (the first monitored event at all MES except Malibu Creek; 0.25 to 0.75 inches) and 2014-15Event08 (the first monitored event at the Malibu Creek MES; 0.98 inches). Many constituent loads were highest during 2014-15Event09 or 2014-15Event10.

During dry weather, constituent loads varied between stations and between sampling events. Loads were generally greater during the first event at the Dominguez Channel and Santa Clara River MES, and during the second event at the Ballona Creek, Malibu Creek, Los Angeles River, and Coyote Creek MES. Variability was generally low (1-3 times), but higher variability was observed in some cases for *E. coli*, TSS, dissolved chromium, and total phosphorus loads.

Overall, constituent loads were highest at the Los Angeles River MES and lowest at the Santa Clara River MES.

ES.3.4 Trash Monitoring

The 2001 Permit required a minimum of one photograph at each MES after the first storm event and three additional storm events per year. During the 2014-2015 monitoring season, visual observations of trash were made, and at least one photograph was taken at each MES after the first storm event and at least three additional storm events, with the exception of the Santa Clara MES (two additional storms).

ES.3.5 Tributary Monitoring

The 2001 Monitoring Program provided that there shall be tributary monitoring in an attempt to identify sub-watersheds where stormwater discharges are causing or contributing to exceedances of water quality standards and to prioritize drainage and sub-drainage areas in need of management actions. A summary of the constituents that did not meet applicable WQOs at tributary stations for at least one event is presented in the table below.

Summary of Constituents That Did Not Meet Water Quality Objectives at Tributary Stations during 2014-2015 for One or More Events

Tributary/Sub-Watershed	Wet	Dry
Upper Las Virgenes Creek (TS25)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved oxygen	*E. coli*, Sulfate, TDS
Cheseboro Canyon (TS26)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved oxygen	Sulfate, TDS
Lower Lindero Creek (TS27)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved cadmium, Dissolved oxygen	*E. coli*, Sulfate
Medea Creek (TS28)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved cadmium, Sulfate, Dissolved oxygen	Sulfate, TDS
Liberty Canyon Channel (TS29)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved oxygen	*E. coli*, Sulfate
PD 728 at Foxfield Dr. (TS30)	*E. coli*, Dissolved copper, Dissolved zinc, Dissolved oxygen	*E. coli*, Sulfate

TDS – total dissolved solids.

ES.3.6 Correlations to Total Suspended Solids

A Spearman's Rank Test was used to determine whether a significant positive or negative correlation existed between analyte results and TSS concentrations at each MES and tributary station during wet weather conditions. Due to the small sample size (n=3) during the 2014-2015 monitoring season, the findings at the MES should be considered as likely correlations. Summaries of constituents found to have correlations to TSS concentrations at the MES and tributary stations are presented in the following tables. Priority constituents (those constituents that did not meet WQOs in one or more monitoring events) are marked with an asterisk.

Likely Correlations Between Constituents and Total Suspended Solids at Mass Emission Stations

Mass Emission/Watershed	Wet	
	Positively Correlated with TSS	Negatively Correlated with TSS
Ballona Creek (S01) [1]	*E. coli**, alkalinity, total phosphorus, turbidity, VSS, dissolved aluminum, dissolved arsenic, dissolved barium, dissolved cadmium, dissolved chromium, dissolved copper*, dissolved iron, dissolved lead*, dissolved nickel, dissolved zinc*, aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, nickel, silver, zinc	Total coliform, DO*, pH*, nitrate-NO_3, nitrate-N
Malibu Creek (S02) [1]	VSS	Chloride, dissolved barium, aluminum
Los Angeles River (S10) [1]	Fecal coliform, cyanide, Kjeldahl N, turbidity, VSS, dissolved barium, dissolved cadmium, dissolved chromium, dissolved copper*, dissolved iron, dissolved lead*, dissolved nickel, arsenic, barium, cadmium, iron, lead, silver	pH
Coyote Creek (S13) [1]	Fecal coliform, alkalinity, hardness, Kjeldahl N, turbidity, VSS	None
San Gabriel River (S14) [1]	pH, Turbidity, VSS	Total coliform, BOD, COD, dissolved phosphorus, dissolved nickel, antimony, zinc
Dominguez Channel (S28) [1]	Kjeldahl N, turbidity, VSS	*E. coli**, fecal coliform, fecal enterococcus, fecal streptococcus, pH
Santa Clara River (S29) [1]	BOD, dissolved phosphorus, total phosphorus, VSS, arsenic, barium, cadmium, chromium, iron, nickel, silver	Fecal coliform, pH

* Priority constituent
[1] Likely correlations; too few wet weather events for confirmation
DO = dissolved oxygen VSS = volatile suspended solids
BOD = biochemical oxygen demand COD = chemical oxygen demand

Correlations Between Constituents and Total Suspended Solids at Tributary Stations

Tributary Station	Wet	
	Positively Correlated with TSS	Negatively Correlated with TSS
Upper Las Virgenes Creek (TS25)	Total phosphorus, VSS, dissolved aluminum, dissolved barium, dissolved cadmium, dissolved iron, dissolved lead, aluminum, arsenic, barium, cadmium, iron, lead	None
Cheseboro Canyon (TS26)	VSS	None
Lower Lindero Creek (TS27)	Kjeldahl N, nitrate-NO_3, nitrate-N, arsenic, iron	None
Medea Creek (TS28)	Kjeldahl N, VSS, dissolved aluminum, dissolved arsenic, dissolved iron, dissolved lead, aluminum, arsenic, chromium, iron	None
Liberty Canyon Channel (TS29)	Dissolved aluminum, dissolved cadmium, dissolved chromium, dissolved iron	None
PD 728 at Foxfield Dr. (TS30)	BOD, chloride, hardness, total phosphorus, VSS, dissolved aluminum, dissolved cadmium, dissolved chromium, dissolved iron	DO*, pH

* Priority constituent
DO = dissolved oxygen
VSS = volatile suspended solids
BOD = biochemical oxygen demand

ES.3.7 Total Suspended Solids Trend Analysis

TSS concentrations from 2000 to 2015 were evaluated separately for wet and dry weather at each MES. The summary table below presents the method used for trend evaluation and the statistical trend information on TSS data collected at each MES over the past 15 years.

Trend Analysis of Wet Weather Total Suspended Solids Concentrations at Mass Emission Stations from 2000–2015

Station	p-value	Method	Trend
Ballona Creek at Sawtelle (S01)	0.226	Mann-Kendall	Not significant
Malibu Creek at Piuma (S02)	**0.028**	Regression	Significant decreasing
Los Angeles River at Wardlow (S10)	0.933	Regression	Not significant
Coyote Creek at Spring (S13)	0.426	Mann-Kendall	Not significant
San Gabriel River (S14)	**0.027**	Regression	Significant decreasing
Dominguez Channel at Artesia (S28)	0.107	Mann-Kendall	Not significant
Santa Clara River (S29)	0.056	Mann-Kendall	Not significant

Bold text indicates significant trend ($p < 0.05$)

Trend Analysis of Dry Weather Total Suspended Solids Concentrations at Mass Emission Stations from 2000–2015

Station	p-value	Method	Trend
Ballona Creek at Sawtelle (S01)	0.581	Regression	Not significant
Malibu Creek at Piuma (S02)	**0.006**	Regression	Significant decreasing
Los Angeles River at Wardlow (S10)	0.348	Regression	Not significant
Coyote Creek at Spring (S13)	0.235	Regression	Not significant
San Gabriel River (S14)	0.154	Regression	Not significant
Dominguez Channel at Artesia (S28)	0.687	Regression	Not significant
Santa Clara River (S29)	**0.005**	Mann-Kendall	Significant Decreasing

Bold text indicates significant trend ($p < 0.05$)

ES.4 Conclusions and Recommendations

Data collected during the 2014-2015 monitoring year were consistent with those observed during previous monitoring years. During wet weather, nutrients and organics continued to meet water quality objectives at the MES and tributary stations. An exception was nitrite, which was measured above the water quality objective at the Ballona Creek and Los Angeles River MES. The last exceedance of nitrite was measured at the Ballona Creek MES during the 2009-2010 monitoring year. E. coli, several dissolved metals (copper, lead and zinc), and pH continued to not meet water quality objectives at several MES and tributary stations during wet weather. During dry weather, dissolved metals, nutrients, and organics continued to meet water quality objectives at MES and tributary stations. E. coli and pH occasionally did not meet water quality objectives, and sulfate continued to not meet water quality objectives at most tributary stations and at the Malibu Creek MES.

Long term trend analysis of the priority constituents in each watershed may provide valuable information regarding evolving watershed conditions. This additional piece of information would assist in management decisions as the County and other agencies move forward under the Watershed Management Programs (WMPs) and Enhanced Watershed Management Programs (EWMPs) developed in accordance with the 2012 Permit. Additionally, field monitoring of DO and pH continue to be incorporated into the monitoring program and will limit the impact of external conditions (sample handling, transportation, water hardness, and alkalinity) on sample results. Sampling guidelines generally call for the measurement of DO as soon as possible after sampling, and measuring pH in the field may limit effects of water hardness and alkalinity on changes to the pH levels measured in the analytical laboratory.

The 2012 Permit provides a watershed management approach to address water quality protection. In accordance with the 2012 Permit, the County of Los Angeles and the LACFCD developed CIMPs for their respective watersheds, through which their monitoring obligations will be met. Most of these CIMPs have been approved, or approved with conditions. The County and the LACFCD are currently awaiting approval of the remaining CIMPs. Assuming the CIMPs are approved prior to the start of the monitoring year, monitoring during the 2015-2016 monitoring year will be conducted under the protocols set forth in those plans.